

Soil Moisture Active Passive **SMAP**

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NASA'S EARTH OBSERVATION MISSION

to measure soil moisture and freeze/thaw
state globally, and provide improved
estimates of net ecosystem exchange

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SMAP products include*:

1. RADAR RAW DATA in time order – 12 hr latency (L1A_Radar)
2. RADIOMETER RAW DATA in time order – 12 hr latency (L1A_Radiometer)
3. LOW RESOLUTION RADAR σ_0 in time order – 12 hr latency (L1B_s0_LoRes)
4. RADIOMETER T_B IN TIME ORDER – 12 hr latency (L1B_TB)
5. HIGH RESOLUTION σ_0 – half orbit, gridded, 1 km, 12 hr latency (L1C_s0_HiRes)
6. RADIOMETER T_B – half orbit, gridded, 36 km, 12 hr latency (L1C_TB)
7. SOIL MOISTURE – radiometer, half orbit, 36 km, 24 hr latency (L2_SM_P)
8. SOIL MOISTURE – radar/radiometer, half orbit, 9 km, 24 hr latency (L2_SM_A/P)
9. FREEZE/THAW STATE – radar, daily composite, 3 km, 48 hr latency (L3_F/T_A)
10. SOIL MOISTURE – radiometer, daily composite, 36 km, 48 hr latency (L3_SM_P)
11. SOIL MOISTURE – radar/radiometer, daily composite, 9 km, 48 hr latency (L3_SM_A/P)
12. SOIL MOISTURE – surface and root zone, 9 km, 7 day latency (L4_SM)
13. CARBON NET ECOSYSTEM EXCHANGE (NEE) – 1 km, 14 day latency (L4_C)

* Mean latency under normal operating conditions. Latency is defined as time from data acquisition by instrument to availability to designated archive. The SMAP project will make a best effort to reduce these latencies.

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The Soil Moisture Active Passive (SMAP) mission, targeted for launch by NASA in 2014, will make global measurements of soil moisture and freeze/thaw state, leading to improved estimates of net ecosystem exchange (NEE). The SMAP measurements will be significant improvements over those provided by the Advanced Microwave Scanning Radiometer (AMSR-E) on board the Earth Observing System and the recently launched European Space Agency Soil Moisture & Ocean Salinity (SMOS) mission. SMAP soil moisture measurements will be provided with volumetric accuracy of $0.04 \text{ cm}^3 \cdot \text{cm}^{-3}$, spatial resolution of 9 km, and refresh rate of ≤ 3 days.

SMAP is able to achieve advancement in soil moisture spatial resolution and accuracy through a combination of passive radiometer measurements at 1.4 GHz and active radar measurements at 1.26 GHz. The radiometer soil moisture measurements are highly accurate due to reduced influence by surface roughness and vegetation structure/water content, but have relatively coarse resolution at 40 km. The radar soil moisture measurements are relatively more susceptible to roughness and vegetation, but increase the spatial resolution to 1 – 3 km.

A number of field campaigns are being undertaken to test and validate the SMAP algorithms, including the recently completed CanEx campaign at BOREAS sites near Saskatoon, Canada, where in situ measurements were conducted simultaneously with overflights of an airborne radiometer and a synthetic aperture radar, as well with as synchronous satellite overpasses by SMOS and AMSR-E. SMAP produces 13 different products with 4 levels of processing. © 2010 All rights reserved.

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